I CLAIM AS MY INVENTION:

1. A method for automatically creating a template for a morphology-sensitive cardiac signal detector, comprising the steps of:

recording and filtering an IEGM signal from a patient for a predetermined duration, thereby obtaining a filtered IEGM signal;

storing said filtered IEGM signal, thereby obtaining a stored IEGM signal;

analyzing said stored IEGM signal to identify all signal deflections in said IEGM signal which exceed a predetermined level, to obtain preliminarily identified signal deflections;

analyzing respective time intervals between said preliminarily identified deflections and selecting deflections, as selected deflections from among said preliminarily identified deflections dependent on said time interval;

categorizing said selected deflections into a predetermined number of classes;

determining at least one of said classes as most representative for a QRS complex; and

creating a QRS template from the selected deflections in said at least one of said classes.

2. A method as claimed in claim 1 wherein said preliminarily identified deflections include a deflection having a maximum deflection amplitude, and wherein the step of analyzing the respective time intervals comprises:

selecting preliminarily identified deflections in amplitude-descending order, starting with said deflection having said maximum deflection amplitude and ending with a preliminarily identified deflection having a lowest amplitude in a predetermined percentage range of said maximum

deflection amplitude and, as said preliminarily identified deflections are selected in said amplitude-descending order, excluding selection of preliminarily identified deflections in a window surrounding a previously selected preliminarily identified deflection.

3. A method as claimed in claim 2 wherein said predetermined percentage range is 40%-75% of said maximum deflection amplitude.

4. A method as claimed in claim 2 wherein said window is in a range from 200-500 ms before a previously selected preliminarily identified deflection until 200-500 ms after that previously selected preliminarily identified deflection.

5. A method as claimed in claim 1 wherein the step of filtering said IEGM signal comprises filtering said IEGM signal with a matched filter having said template, and wherein the step of creating said template comprises from said preliminarily identified deflections, selecting a predetermined number of deflections having largest amplitudes and separated from each other by a predetermined interval, averaging said predetermined number of deflections to obtain a first preliminary template selecting a percentage of said predetermined number of deflections most similar to said preliminary template and creating an updated template from said predetermined percentage of deflections, and continually updating said template using said predetermined number of deflections most similar to the current template.

6. A method as claimed in claim 5 wherein said predetermined number is in a range between 4 and 15, wherein said predetermined interval is in a range between 200 and 500 ms, and wherein said predetermined percentage is in a range between 60% and 80%.

7. A method as claimed in claim 1 wherein the step of analyzing said preliminarily identified deflections includes gradually decreasing a sensing threshold until at least two of said preliminarily identified deflections are detected which are separated at least first by a predetermined interval, selecting said at least two preliminarily identified deflections as selected deflections, and thereby leaving a remainder of said preliminarily identified deflections, repeatedly finding a longest interval between two further preliminarily identified signal deflections in said remainder and selecting a preliminarily identified deflection in said longest interval which is separated from a previously selected preliminarily identified deflection by said first predetermined interval until one of (a) an average between selected deflections is less than a second predetermined interval and a maximum interval is less than a predetermined interval, and (b) said average interval is less than a minimum interval in a third predetermined range.

8. A method as claimed in claim 7 wherein said first predetermined interval is a range between 200-500 ms, said second predetermined interval is in a range between 1000-2000 ms, said third predetermined interval is in a range between 1500-3000 ms, and wherein said minimum interval is in a range between 400-800 ms.

9. A method as claimed in claim 1 wherein the step of filtering said IEGM signal comprises filtering said IEGM signal with a matched filter having said template, and wherein the step of creating said template comprises selecting from said preliminarily identified deflections, a predetermined number of deflections having largest amplitudes and separated from each other by a predetermined interval, averaging said predetermined number of deflections to obtain a first preliminary template selecting a percentage of said predetermined number of deflections most similar to said preliminary

template and creating an updated template from said predetermined percentage of deflections, and continually updating said template using said predetermined number of deflections most similar to the current template.

10. A method as claimed in claim 9 wherein said predetermined number is in a range between 4 and 15, wherein said predetermined interval is in a range between 200 and 500 ms, and wherein said predetermined percentage is in a range between 60% and 80%.

11. A method as claimed in claim 1 comprising shifting said preliminarily identified deflections by predetermined time intervals in steps in opposite directions, and for each step identifying a Euclidean distance to a current template, and employing a shifted deflection having a smallest Euclidean distance to the current template for use in updating said current template.

12. A method as claimed in claim 11 wherein said time interval is in a range between 0 and 15 ms, and wherein said step is in a range between one and two ms.

13. A method as claimed in claim 1 comprising employing a Generalized Lloyd Algorithm to determine respective centers of said classes, for determining said at least one class most representative of a QRS complex.

14. A method as claimed in claim 1 comprising identifying said at least one class that is most representative of a QRS complex as the class having a highest morphology similarity to an actual QRS complex.

15. A method as claimed in claim 1 comprising selecting said at least one class as most representative of a QRS complex having a minimum measure of dissimilarity calculated using the Euclidean distance between class constituents.

16. A method as claimed in claim 1 comprising selecting said at least one class as most representative of a QRS complex having a largest negative downstroke.

17. A method as claimed in claim 1 comprising selecting said at least one class as most representative of a QRS complex having a highest amplitude.

18. A method as claimed in claim 1 comprising selecting said at least one class as most representative of a QRS complex as having a repetition rate within a normal physiological range for cardiac activity.

19. A method as claimed in claim 1 wherein the step of recording and filtering said IEG signal comprises filtering said IEG signal during recording thereof.

20. A method as claimed in claim 1 wherein the step of recording and filtering said IEG signal comprises filtering said IEG signal after recording thereof.

21. A cardiac stimulating device having a template for a morphology-sensitive cardiac signal detector, comprising the steps of:

circuitry for recording an IEGM signal from a patient for a predetermined duration;

a filter which filters said IEGM signal, thereby obtaining a filtered IEGM signal;

a memory for storing said filtered IEGM signal, as a stored signal;

a processor for analyzing said stored IEGM signal to identify all signal deflections in said IEGM signal which exceed a predetermined level, to obtain preliminarily identified signal deflections; and

said processor being programmed to analyze respective time intervals between said preliminarily identified deflections and selecting deflections, as selected deflections from among said preliminarily identified deflections dependent on said time interval, categorize said selected deflections into

a predetermined number of classes, determine at least one of said classes as most representative for a QRS complex, and create a QRS template from the selected deflections in said at least one of said classes.

22. A cardiac stimulating device as claimed in claim 21 wherein said preliminarily identified deflections include a deflection having a maximum deflection amplitude, and wherein said processor is programmed to analyze the respective time intervals by selecting preliminarily identified deflections in amplitude-descending order, starting with said deflection having said maximum deflection amplitude and ending with a preliminarily identified deflection having a lowest amplitude in a predetermined percentage range of said maximum deflection amplitude and, as said preliminarily identified deflections are selected in said amplitude-descending order, excluding selection of preliminarily identified deflections in a window surrounding a previously selected preliminarily identified deflection.

23. A cardiac stimulating device as claimed in claim 22 wherein said predetermined percentage range is 40%-75% of said maximum deflection amplitude.

24. A cardiac stimulating device as claimed in claim 22 wherein said window is in a range from 200-500 ms before a previously selected preliminarily identified deflection until 200-500 ms after that previously selected preliminarily identified deflection.

25. A cardiac stimulating device as claimed in claim 21 said filter is a matched filter having said template, and wherein said processor is programmed to create said template by selecting from said preliminarily identified deflections, a predetermined number of deflections having largest amplitudes and separated from each other by a predetermined interval, averaging said predetermined number of deflections to obtain

a first preliminary template selecting a percentage of said predetermined number of deflections most similar to said preliminary template and creating an updated template from said predetermined percentage of deflections, and continually updating said template using said predetermined number of deflections most similar to the current template.

26. A cardiac stimulating device as claimed in claim 25 wherein said predetermined number is in a range between 4 and 15, wherein said predetermined interval is in a range between 200 and 500 ms, and wherein said predetermined percentage is in a range between 60% and 80%.

27. A cardiac stimulating device as claimed in claim 21 wherein said processor analyzes said preliminarily identified deflections includes by gradually decreasing a sensing threshold until at least two of said preliminarily identified deflections are detected which are separated at least by a first predetermined interval, selecting said at least two preliminarily identified deflections as selected deflections, and thereby leaving a remainder of said preliminarily identified deflections, repeatedly finding a longest interval between two further preliminarily identified signal deflections in said remainder and selecting a preliminarily identified deflection in said longest interval which is separated from a previously selected preliminarily identified deflection by said first predetermined interval until one of (a) an average between selected deflections is less than a second predetermined interval and a maximum interval is less than a third predetermined interval, and (b) said average interval is less than a minimum interval in a predetermined range.

28. A cardiac stimulating device as claimed in claim 27 wherein said first predetermined interval is a range between 200-500 ms, said second predetermined interval is in a range between 1000-2000 ms, said third predetermined interval is in a range between 1500-3000 ms, and wherein said minimum interval is in a range between 400-800 ms.

29. A cardiac stimulating device as claimed in claim 21 wherein said filtering with a matched filter having said template, and wherein said processor is programmed to create said template from said preliminarily identified deflections, by selecting a predetermined number of deflections having largest amplitudes and separated from each other by a predetermined interval, averaging said predetermined number of deflections to obtain a first preliminary template selecting a percentage of said predetermined number of deflections most similar to said preliminary template and creating an updated template from said predetermined percentage of deflections, and continually updating said template using said predetermined number of deflections most similar to the current template.

30. A cardiac stimulating device as claimed in claim 29 wherein said predetermined number is in a range between 4 and 15, wherein said predetermined interval is in a range between 200 and 500 ms, and wherein said predetermined percentage is in a range between 60% and 80%.

31. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to shift said preliminarily identified deflections by predetermined time intervals in steps in opposite directions, and for each step to identify a Euclidean distance to a current template, and to employ a shifted deflection having

a smallest Euclidean distance to the current template for use in updating said current template.

32. A cardiac stimulating device as claimed in claim 31 wherein said time interval is in a range between 0 and 15 ms, and wherein said step is in a range between one and two ms.

33. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to employ a Generalized Lloyd Algorithm to determine respective centers of said classes, for determining said at least one class most representative of a QRS complex.

34. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to identify said at least one class that is most representative of a QRS complex as the class having a highest morphology similarity to an actual QRS complex.

35. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to employ a Generalized Lloyd Algorithm to identify respective centers of said classes, and selecting said at least one class as most representative of a QRS complex having a minimum Euclidean distance to its class center.

36. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to select said at least one class as most representative of a QRS complex having a largest negative downstroke.

37. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to select said at least one class as most representative of a QRS complex having a highest amplitude.

38. A cardiac stimulating device as claimed in claim 21 wherein said processor is programmed to select said at least one class as most representative of a QRS complex as having a repetition rate within a normal physiological range for cardiac activity.

39. A cardiac stimulating device as claimed in claim 21 wherein said filter filters said IEGM signal during recording thereof.

40. A cardiac stimulating device as claimed in claim 21 wherein said filter filters said IEGM signal after recording thereof.